

## **COMPACT LOCKING BLOCK FOR SEMI-AUTOMATIC PISTOLS**

### **CROSS REFERENCE TO RELATED APPLICATION**

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/446,407, filed on February 11, 2003, entitled "COMPACT LOCKING BLOCK FOR SEMI-AUTOMATIC PISTOLS" herein incorporated by reference in its entirety.

### **FIELD OF THE INVENTION**

[0002] The present invention relates generally to a locking block for a semiautomatic pistol and more particularly to a compact locking block for a compact, polymer frame, high-powered pistol that reduces the potential for overstress in the polymer frame and locking block created by the recoil force of the pistol upon discharge.

### **BACKGROUND OF THE INVENTION**

[0003] Semi-automatic pistols can be divided into a number of different types. These include pistols that use a blowback mechanism and those that utilize a short-recoil Browning-type mechanism.

[0004] With blowback pistols, only the slide moves relative to the frame of the gun upon discharge. The barrel of a blowback pistol is fixed to the frame but the slide is not secured to the barrel. Immediately after firing the pistol, the recoil force starts to drive the slide rearward commencing the extraction of the spent cartridge case. Accordingly, part of the extraction of the case occurs during the high-pressure period of the firing cycle. If the slide is too light, the case is extracted too soon it is possible that a case rupture could result, potentially leading to a failure of the loading cycle. As a result, the blowback mechanism is typically used with low-powered cartridges since there is a

practical limit to the mass of the slide. Semi-automatic pistols for higher-powered cartridges generally utilize a short-recoil mechanism.

[0005] With short-recoil operated pistols, as depicted in U.S. Pat. No. 5,717,156 hereby incorporated by reference in its entirety, both the barrel and slide move rearward upon discharge of the gun. Prior to the firing of the cartridge, the barrel is engaged to the slide by a locking mechanism. After firing, the recoil force drives both the slide and barrel rearward, but since they are in engagement, the extraction of the case has not started. After the high-pressure period has passed, an actuator begins to disengage the barrel from the slide. The barrel travels a short distance before coming to rest forward of the magazine, hence short-recoil, and is completely disengaged from the slide. The slide continues and begins extraction of the spent cartridge case using its kinetic energy and the residual gas pressure in the barrel. After extraction, the spent case is ejected. The slide continues until full travel is reached.

[0006] In short-recoil operated pistols, the barrel may be locked to the slide by a number of locking mechanism. The barrel may be provided with peripheral ribs, studs, lugs or other mechanism and may be rotated, cammed or otherwise engaged and disengaged from the slide. Alternatively, a separate locking block may be used to lock the barrel to the slide. A common method utilizing a locking block is the dropping barrel method as depicted in U.S. Pat. No. 4,915,011 hereby incorporated by reference in its entirety.

[0007] In the dropping barrel method of locking, the barrel is slidably mounted for straight line longitudinal motion, and the locking mechanism comprises a separate locking block provided with an actuation mechanism for engaging the barrel to the slide. The actuation mechanism comprises a cam on the frame operative to cam the locking block downwardly from engagement with the slide during initial rearward movement of the slide from the battery position and upwardly to engage the slide during final movement of the slide to the forward battery position.

[0008] In metal frame pistols, the slide is usually secured for such movement by longitudinally spaced pairs of metal guide rails. The guide rails generally include four rails, one forward and one rear pair. Additionally, the fixed cam is machined into the frame.

[0009] In recent years there has been a trend in the pistol industry to utilize polymers in the manufacture of semi-automatic pistols, particularly in fabricating unitary frames therefor by injection molding techniques. Generally, in such frames, the front and rear pair or spaced guide rails are partially embedded in the polymer of the frame. The cam is assembled into the frame and held by a cross pin. The locking block is located between the two sets of rails. Polymer frame pistols are desirable in that they are lighter than pistols with metal frames.

[0010] Currently, gun manufacturers are making compact polymer frame pistols which feature a reduced length frame, slide and barrel as disclosed in U.S. Pat. No. 5,717,156, which is hereby incorporated by reference in its entirety. Compact pistols are smaller and lighter than standard size semi-automatic pistols. Additionally, the reduction in trigger reach and grip circumference of compact designs increases concealability and is thought to enhance shooting ergonomics. Compact designs are available for both low-powered and high-powered cartridges.

[0011] The recoil force in compact pistols is distributed over a smaller area than a standard size pistol due to the compact size of the frame and slide. Upon discharge, the slide forcibly contacts the locking block which, if the force is great enough to cause relative motion of the block with the frame, could potentially lead to overstress in the frame. Additionally, the possibility exists for overstress in the locking block itself caused by relative motion between the block and the slide upon discharge of the pistol. Over a period of time, overstress in the frame could potentially lead to a dropout in the polymer material of the frame and overstress in the locking block could possibly lead to a disruption of the firing cycle.

[0012] A preferred embodiment of the locking block of the present invention eliminates the possibility of overstress in the polymer frame by preventing any potential relative motion of the block and frame upon discharge with the addition of transverse ribs on the side of the locking block, which engage mating slots in the frame and secure the block to the frame. Additionally, a preferred embodiment of the locking block includes the pair of forward guide rails, which are normally separate from the locking block. As mentioned above, by combining the normally separate guide rails with the locking block prevents any potential relative motion of the block and frame upon discharge of the pistol.

[0013] The possibility of overstress of the locking block itself, potentially caused by relative motion between the block and the slide, is further eliminated in a preferred embodiment of the present invention by the inclusion of a space or discontinuity between the transverse rib and each guide rail, adding chamfers to the front and rear edges of the guide rails and adding arcuate, convex bottom surfaces to the guide rails.

[0014] Additionally, a locking block manufactured in accordance with the present invention allows for a more compact design by combining the forward guide rails with the locking block while addressing the potential high stress issues in both the block and polymer frame caused by this combination of parts.

### **SUMMARY OF THE INVENTION**

[0015] Accordingly, it is an object of the present invention to provide an improved, compact locking block mechanism for a compact semi-automatic pistol that eliminates potential overstress in both the locking block and frame of the pistol.

[0016] A preferred embodiment of the present invention is a locking block for a semi-automatic pistol having a frame, a slide, a barrel and a firing mechanism.

The locking block includes a front end having an opening shaped to accommodate the barrel of the pistol and a rear end. The block also includes laterally spaced side walls, each side wall having a guide rail which engages a longitudinally extending groove formed in the slide and guides the slide forward and rearward relative to the frame of the pistol. The guide rails have front and rear edge surfaces and a bottom surface. The locking block also includes a mechanism for securing the locking block to the frame of the pistol and

[0017] a mechanism for reducing the relative movement of the block and frame upon discharge of the pistol.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0018] FIG. 1 is a perspective exploded view of a semi-automatic pistol containing the prior art-locking block.

[0019] FIG. 2 is a perspective view on an enlarged scale of the prior art-locking block and forward guide rails.

[0020] FIG. 3 is a perspective exploded view of a semi-automatic pistol containing the locking block of the present invention.

[0021] FIG. 4 is a perspective view on an enlarged scale of the locking block of the present invention.

[0022] FIG. 5 is an additional perspective view on an enlarged scale of the locking block of FIG. 5.

[0023] FIG. 6 is an enlarged perspective view of the locking block illustrating the radii on and below one of the guide rails.

[0024] FIG. 7 is an enlarged perspective view of the locking showing the U-shaped opening and illustrating the chamfered edge surfaces of the guide rails.

[0025] FIG. 8 is an enlarged perspective view of the locking block illustrating the chamfered rear edge surface of a guide rail and the radius along the bottom surface of a wing.

[0026] FIG. 9 is an enlarged perspective view of the locking block illustrating the chamfered front edge surfaces of the guide rails.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

[0027] FIGS. 1 and 2 show prior art locking blocks. FIG. 2 depicts a prior art block in which the guide rails 5 are separate from the block 7. As discussed in detail below, the present invention features a locking block with integral guide rails.

[0028] Referring to FIG. 3, a preferred embodiment of a pistol of the type embodying the present invention is shown. The pistol comprises a polymer frame 12, and a barrel 14 affixed medially of the forward end 4 and after-end 6 of the pistol. A slide 16 is disposed for reciprocal movement relative to the barrel and frame. The barrel has a firing axis f.

[0029] The frame 12 is preferably a unitary structure fabricated by injection molding a high strength, heat and corrosion resistant polymer, such as Nylon 66.

[0030] As will be noted in FIG. 4, the frame 12 comprises an upwardly open channel 2 extending over the length of the frame generally from one end 4 to the other end 6 thereof. A handgrip portion 8 of ergonomic configuration is also shown. The frame is adapted to house a firing mechanism (not shown) and the barrel 14. The handgrip 8 defines a downwardly and upwardly opening chamber 9 adapted to removably receive therein a magazine (not shown).

[0031] The slide 16, as its name suggests, is the member which performs the actions resulting from pulling the trigger and, causes movement of the sear of

the firing mechanism (not shown). The slide is depicted in U.S. Pat. No. 5,386,659, which is hereby incorporated by reference in its entirety. The sear interacts with a striker type firing pin disposed in the breechblock in the rear end portion of the slide 16 with the result being that the firing pin would be cocked and released. If a round is in the chamber, it is then fired. As a result of the energy released thereby, the slide 16 and the barrel 14 are moved rearward compressing the recoil spring (not shown).

[0032] During recoil, the empty shell casing is extracted from the chamber of the barrel 14 by an extractor (not shown) and expelled through the opening 19 in the slide 16. Compression of the recoil spring continues until the kinetic energy, having been imparted to the slide 16, is reduced to a level wherein the potential energy being imparted to the recoil spring as it is being compressed, becomes greater than the kinetic energy. When that occurs, the recoil spring will begin to expand and, in so doing will return the slide 16 to its forward position.

[0033] A pair of opposed, inwardly opening and longitudinally extending grooves 18 are disposed at the rear end of the slide 16 as best shown in FIG. 3. The grooves 18 are dimensioned, configured, oriented and spaced apart to engage protruding guide members 20 on the after-end portion of the frame of the pistol. Additionally, bilateral guide rails 104 of the locking block of the present invention engage the longitudinally extending grooves 18 for longitudinally guiding the slide 16 forward and rearward. The bilateral guide rails 104 will be discussed in greater detail below.

[0034] The forward portion of the slide 16 is also retained and guided during its movement by the interrelationship of the barrel 14 and slide 16. In that regard, an aperture 36 is provided through a front end wall of the slide 16 and which is adapted to receive therethrough the forward, muzzle end of the barrel 14. The barrel 14 retains the slide 16 in its assembled and parallel relation to the upper edges 39 of the frame 12 and guide its reciprocal, longitudinal motion therealong which occurs whenever the pistol 10 is fired.

[0035] Now referring to FIGS. 4 and 6, the preferred embodiment of the locking block 100 of the present invention includes a front end, relative to the forward end 4 of the frame (FIG. 4), which is defined by a U-shaped opening 102. The locking block 100 also features bilateral guide rails 104 on the sidewalls 108, 110 (FIG. 5) of the block. The block has a transverse rib 120 on each block's sidewalls 108, 110. The transverse ribs 120 extend with a form fit into corresponding transverse grooves (not shown) formed in the frame 12. The transverse rib function to reduce the relative movement of the block and the frame upon discharge of the pistol.

[0036] Referring to FIG. 6, in its preferred embodiment, the block 100 has a transverse bore 106, which passes through the sidewalls of the block 108, 110. When the block is inserted into the frame 12 (FIG. 3), the transverse bore 106, is in alignment with transverse bores or openings in the sidewalls 50, 51 of the frame 12. A pin (not shown) is inserted into the bores to secure the block 100 to the frame 12. Additionally, there is a transverse bore 109 directly below the U-shaped opening 102 which accepts a pin (not shown) to secure the block to the frame of the pistol through transverse bores 55 in the frame.

[0037] Again referring to FIGS. 6 and 7, in its preferred embodiment, the transverse ribs 120 are located below the bilateral guide rails 104 on the sidewalls 108, 110 of the block. The surface of the transverse ribs 120 begin at the lower surface of the sidewall of the block. The surface of the transverse ribs 120 continue upward away from the frame toward the slide of the pistol. The surface of the ribs terminate with cut away, convex surfaces 130 which separate the ribs 120 from the bilateral guide rails 104. This separation or discontinuity between the ribs and guide rails helps reduce the possibility relative motion between the block and the slide. Referring to Figure 7, a portion of the convex surface 130 forms the underside of the bilateral guide rails 104.

[0038] Additionally, referring to FIGS. 7 and 8, in the preferred embodiment, both of the bilateral guide rails 104 include a front edge 140 and back edge 150,



relative to the forward end 4 and after end 6 of the pistol (FIG. 4), which have chamfered surfaces 160.

[0039] Referring to FIG. 9 the edges are chamfered such that an upper and lower portion of each edge are cut away at an angle resulting in three surfaces per front edge 140 and back edge 150 of each guide rail. In its preferred embodiment, each chamfer in the edge surfaces 140, 150 have an approximately .4 mm cut at a chamfer angle of approximately 45°.

[0040] Again referring to FIG. 9, in its preferred embodiment, the guide rails also have an arcuate, convex bottom surface 190. The convex bottom surface 190 along with the chamfered front and back edges 140, 150 prevent the slide, upon discharge of the pistol, from catching or 'biting' enough surface of the leading or trailing edge of the bilateral guide rails potentially causing a material failure in the polymer frame. The bilateral guide rails 104 protrude from the frame, for engagement with the longitudinally extending grooves 18, through longitudinal openings 180 in the frame 14.

[0041] Referring to FIG. 8, in its preferred embodiment, the block has a crossbar 200 at the rear end of the block. The crossbar 200 halts the rearward longitudinal movement of the barrel 14 upon discharge of the pistol and unlocks the barrel from the slide as discussed below.

[0042] Referring now to FIGS. 3 and 8, when the pistol is discharged, the recoil forces cause the rearward longitudinal movement of the slide 16. Movement of the slide 14 causes the rearward longitudinal movement of the barrel 14 as well in that the barrel 14 and slide 16 are locked. The slide 16 causes the barrel 14 to move longitudinally rearward by the abutting engagement of a frontwardly oriented end face 260 of the barrel and the forward shoulder 250 of the opening 19 in the slide 16.

[0043] Referring to FIGS. 3 and 8, in its preferred embodiment the barrel also includes on its rearward underside a follower lug 210. The follower lug 210 runs

onto the cam track 280 of the block and engages the transversely oriented cross bar 200 of the block. The cam surface 280 and crossbar 200 force the rearward end of the barrel to drop down such that the end face 260 of the barrel and the forward shoulder 250 of the opening 19 disengage allowing the slide 16 to continue its rearward recoil motion. When the slide 16 has reached the end of its longitudinal rearward motion it is urged forward by the spring. The slide moves forward until the rearward shoulder of the slide 282 engages the rearwardly oriented end face of the barrel 284 returning the barrel and slide to their locked ready to fire configuration.

[0044] Although this invention has been shown and described with respect to an exemplary embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions, and additions in the form and detail thereof may be made therein without departing from the spirit and scope of the invention.